REMARKS/ARGUMENTS

Claims 1-14 remain pending in the present application. Claims 1-8 stand rejected only for obviousness-type double patenting in view of one or both of U.S. Patent Nos. 5,486,430 and 5,935,726, and would therefore be allowable upon the filing of an appropriate Terminal Disclaimer. Claim 9 stands rejected for anticipation and claims 10-14 stand rejected for obviousness.

The present application is a continuation of U.S. Patent Application Serial No. 09/322,871 filed on May 28, 1999, now U.S. Patent No. 6,322,914. The '871 application is, in turn, a continuation-in-part of U.S. Patent Application Serial No. 08/980,496 filed December 1, 1997, now U.S. Patent No. 5,935,726 issued August 10, 1999. The disclosure of '496 application was incorporated by reference in its entirety in the '871 CIP application.

The claims of the present continuation application are related to, but generally narrower than, corresponding claims in the prior '496 application (now the '726 patent) and the prior '871 application (now the '914 patent). Of the claims rejected for obviousness, present independent claim 9 corresponds to '726 patent claim 9, but with a slightly different limitation regarding the nature of the fuel stream, namely, that the method of distributing water is performed in a fuel cell utilizing water

in a substantially poison-free fuel stream (present claim 9) rather than water in a substantially pure fuel stream ('726 patent claim 9). Present dependent claim 10 adds further limitations to those recited in its base claim 10.

Present independent claim 11 corresponds to '726 patent claim 1, but with a further limitation that the temperature profile within the oxidant stream is controlled so that oxidant stream temperature generally increases in the flow direction. Present dependent claim 12 adds further limitations to those recited in its base claim 11.

Present independent claim 13 corresponds to '726 patent claim 12, but with further limitations of a coolant system, which comprises at least one coolant passage associated with the fuel cell for receiving a coolant fluid which flows through the coolant passage(s), and a coolant fluid flow switching device for periodically reversing the direction of coolant fluid flow through the coolant passage(s). Present dependent claim 14 adds further limitations to those recited in its base claim 13.

Rejection of Claim 9 under 35 U.S.C. §§102(a) and (e)

In the July 7, 2003 Office Action, claim 9 was rejected under 35 U.S.C. §§102(a) and (e) as being anticipated by Kawatsu U.S. Patent No. 5,677,073. Applicants submit that Kawatsu cannot

anticipate independent claim 9 because Kawatsu nowhere discloses or suggests distributing water, to an ion-exchange membrane ***utilizing water in a substantially poison-free fuel stream***, by periodically reversing the flow direction the fuel stream through the fuel cell.

In fact, Kawatsu is directed at overcoming the problem of poisoning of the electrocatalyst and does not even mention the distribution of water within a fuel cell. Kawatsu is instead directed at compensating for the situation in which a fuel stream ***containing*** CO (a catalyst poison), which is generated by the reforming reaction, is fed to a fuel cell. Even when a greater flow of air is fed to partial oxidizing unit 303 of Kawatsu's reformer 16 in order to lower the concentration of carbon monoxide in the fuel supplied to the fuel cell, the fuel stream still contains a poison - "a relatively low concentration of carbon monoxide" (Kawatsu at column 13, lines 47-55) - and is not "substantially poison-free", as recited in present claim 9.

Furthermore, switching of the fuel flow direction in Kawatsu is triggered when ***poisoning has occurred***, as indicated by a difference in electrode temperatures (see Kawatsu at column 7, line 65 and the text that follows). The flow reversal in Kawatsu is itself an aspect of the poison cancellation mechanism, that is, Kawatsu's flow reversal aids in poisoning cancellation, and

is employed ***because*** the fuel stream entering the fuel cell is ***not*** substantially poison-free, in contrast to the substantially ***poison-free*** fuel stream recited in present claim 9.

Finally, it was observed in the Office Action that, because the overall fuel cell reaction produces water, the flow reversal of Kawatsu would to some extent distribute water in the fuel cell. In fact, however, the water produced by the overall fuel cell reaction in Kawatsu is ***produced at the cathode*** (oxidant side), ***not*** the anode (fuel side) (see, by contrast, the applicants' specification at page 4, line 2 and lines 13-20, and page 13, lines 21-24).

Absent any disclosure or suggestion that water should, or even could, be distributed to a fuel cell ion-exchange membrane utilizing water in a substantially poison-free fuel stream by periodically reversing the fuel stream flow direction, Kawatsu cannot anticipate claim 9. Applicants also submit that the prior determination as to the patentability of '726 patent claim 9 should equally apply to present claim 9, which recites a limitation regarding the nature of the fuel stream (namely, that the method of distributing water is performed in a fuel cell utilizing water in a substantially poison-free fuel stream) that differs only slightly from the limitation recited in '726 patent claim 9 (namely, that the method of distributing water is

performed in a fuel cell utilizing water in a substantially pure fuel stream).

Rejection of Claim 10 under 35 U.S.C. §103(a)

Claim 10, which is dependent upon claim 9, was rejected under 35 U.S.C. §103(a) for obviousness in view of the combination of Kawatsu with Kothmann U.S. Patent No. 4,582,765. As previously discussed with respect to the anticipation rejection of base claim 9, Kawatsu nowhere discloses or suggests distributing water to an ion-exchange membrane *utilizing water in a substantially poison-free fuel stream* by periodically reversing the fuel stream flow direction. Kothmann is equally deficient in that, notwithstanding Kothmann's disclosure of periodically reversing the flow direction of a coolant fluid flowing through a fuel cell, Kothmann nowhere discloses or suggests that water should, or even could, be distributed to a fuel cell ion-exchange membrane by periodically reversing the fuel stream flow direction while also periodically reversing the flow direction of a coolant fluid. Applicants therefore submit that the combination of Kawatsu with Kothmann cannot render claim 10 unpatentable for obviousness.

Rejection of Claims 11-14 under 35 U.S.C. §103(a)

Claims 11-14 were rejected under 35 U.S.C. §103(a) for obviousness in view of the combination of Strasser U.S. Patent

No. 5,543,238 with Doyle U.S. Patent No. 3,553,023 and Kothmann. Although Strasser acknowledges the problem of water balance in the electrolyte during operation of the fuel cells, Strasser nowhere discloses or suggests that the direction of flow of the oxidant or coolant streams should, or even could, be reversed. Moreover, Strasser teaches away from the distribution of water to a fuel cell ion exchange membrane in providing for only partial recirculation of the exhaust gas (see Strasser at column 2, lines 58-61).

Doyle discloses a system for periodically reversing the direction of flow of at least one reactant gas in a liquid electrolyte fuel cell, but does not disclose or suggest a method for distributing water to a fuel cell ion exchange membrane. Doyle instead discloses techniques for removing product water from a fuel cell using a dry oxidant reactant gas stream and soda-lime scrubbing agents (see Doyle at column 3, lines 10-36).

As previously discussed with respect to claim 10, Kothmann's disclosure of periodically reversing the coolant fluid flow direction does not include any disclosure or suggestion of distributing water to a fuel cell ion-exchange membrane by periodically reversing the flow direction of a reactant stream.

In addition, Strasser, Doyle and Kothmann are all silent with respect to the temperature profile within the oxidant stream, and do not contain any disclosure or suggestion of controlling the temperature profile within the oxidant stream such that its temperature generally increases in the flow direction. By contrast, in the method defined in claim 11 a temperature gradient is deliberately created by flowing the oxidant and the coolant in substantially the same direction:

> In one embodiment, to assist in controlling the temperature profile of the oxidant stream, the coolant fluid flow direction is also controlled so that it is substantially concurrent with the oxidant stream flow direction. Accordingly, a coolant fluid flow field is provided which has inlet/outlet ports which are in the same general location relative to the MEA as the oxidant stream inlet/outlet ports; the coolant fluid flow direction through the coolant flow field is periodically reversed substantially simultaneously with the change in oxidant stream flow direction so that the oxidant and coolant streams flow in substantially the same direction within a fuel cell assembly.

(Applicants' specification at page 11, lines 13-27).

Furthermore, Kothmann is directed at achieving ***uniformity*** of the thermal profile of the fuel cell stack. Accordingly, operation of the fuel cell such that the oxidant stream temperature ***increases*** in the flow direction is incompatible with

achieving a *uniform* thermal profile of the fuel cell stack. Therefore, Kothmann teaches away from "controlling the temperature profile within said oxidant stream so that oxidant stream temperature generally increases in the flow direction", as recited in claim 11.

Applicants therefore submit that none of Strasser, Doyle or Kothmann, either alone or in combination, can render any of the applicants' claims 11-14 unpatentable for obviousness. Applicants also submit that the prior determination as to the patentability of '726 patent claim 1 should equally apply to present claim 11, which recites a further limitation that the temperature profile within the oxidant stream is controlled so that oxidant stream temperature generally increases in the flow direction.

Obviousness-Type Double Patenting Rejections

Claims 1-8 were rejected for obviousness-type double patenting in view of the combination of Chow et al. U.S. Patent No. 5,935,726 with Gorbell et al. U.S. Patent No. 5,486,430 (as to claims 1, 2 and 4-7) and in view of the combination of Chow and Gorbell with Kothmann (as to claims 3 and 8). In order to expedite the allowance and issuance of the present application, applicants are submitting herewith a Terminal Disclaimer to overcome the obviousness-type double patenting rejection of

claims 1-8. Applicants' submission is to expedite the prosecution and allowance of the present claims and is without admission as to the accuracy or effect of the obviousness-type double patenting rejection.

* * * * *

In view of the foregoing amendments and remarks, applicants submit that claims 1-14 are allowable. The Examiner is invited to telephone the applicants' undersigned attorney at (312) 775-8123 if any unresolved matters remain.

Please charge any fees incurred in connection with this submission to Deposit Account No. 13-0017.

Respectfully submitted,

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